A METHOD OF TRANSMITTING DATA AND RELATED APPARATUS

This invention relates to a method of transmitting data and to related apparatus. In particular the method may be a way of providing a network based Radio and particularly, but not exclusively, an Internet based radio.

The Internet is becoming a more prevalent means of sharing information and the variety of information that is being shared using the Internet continues to expand. This expansion of the variety of the information is due in part to the increased bandwidth that users are now able to connect to the Internet using technologies such as ADSL (Asymmetric Digital Subscriber Line) often referred to as broadband, and the like.

Such increased bandwidth connections make it possible to stream audio and/or video data across the Internet at a reasonable level of quality. So called Internet radio provides an audio data stream which itself provides an audio program much as transmitted on conventional AM (Amplitude Modulation), FM (Frequency Modulation) and DAB (Digital Audio Broadcasting) radio. Thus an Internet radio station can be accessed from anywhere in the world with Internet access and there is no need to receive a broadcast signal as there is with conventional radio.

An early Internet radio was provided by Kerbango in 1998 and further examples can be seen in patents such as WO00/77655 and US6249810.

According to a first aspect of the invention there is provided a method of transmitting data including an audio stream to a network audio stream receiver across a network connection thereto, the method including providing the receiver with a hardware address that can be read across the

network connection and the method further including reading the address prior to and/or during transmission of the data and tailoring the data according to the address.

Such tailoring of the data is advantageous because it will allow the data to be provided that is specific to the user of a particular receiver.

It will be appreciated that tailoring may include blocking the transmission of the data to a particular receiver. Such tailoring may facilitate the exportation of the receiver to overseas markets.

Additionally, or alternatively, tailoring may include modifying the data such that it is specific to one or more receivers.

In a preferred embodiment the hardware address is unique to the receiver.

However, in some embodiments it may be appropriate to provide a plurality of receivers with the same address. Such embodiments may include the situation in which it is desired to handle a plurality of receivers in the same manner. For example, and as explained below, to provide in-store radio and the like.

In one embodiment the invention provides a method of transmitting data across the Internet. As such the method may provide so called Internet radio.

The method may transmit the data using RTSP (Real Time Stream Protocol) which is a stream request protocol which runs over TCP. As such RTSP is a point-to-point connection. The corresponding data stream is usually transmitted with RTP (Real Time Protocol), which may be layered on UDP or directly on IP, and may be unicast, multicast or

broadcast. Alternatively the HTTP protocol may perform both the request and the transport functions, using the same TCP connection. HTTP is restricted to unicast operation.

The hardware address may be provided by any suitable means. In some embodiments the hardware address may be provided in a write once memory such as a ROM (Read Only Memory), or any other suitable form of write once memory. Having a memory that can be written to once has the advantage that the hardware address cannot be changed once it has been set.

In perhaps the preferred embodiment the hardware address may be provided by an E²PROM (Electrically Erasable Programmable Read Only Memory).

In yet further embodiments the hardware address may be set by means of DIP switches, fusible links or the like.

The method may comprise transmitting data to receivers having predetermined hardware addresses. Such a method allows the data to be tailored to one or more receivers.

Conveniently the method includes providing a user of the receiver with at least one menu from which a selection may be made allowing the user to control the receiver.

The or each menu may be displayed on a display of the receiver. Alternatively, the or each menu may be announced by a speaker or the like of the receiver.

The or each menu may be of a circular nature such that a user can scroll past the end of a menu and be returned to the start of the menu. Such a method is convenient for displays or the like that are capable of displaying limited information.

Conveniently, the method comprises providing a sub menu when a user selects an option from a menu. This may be advantageous because it provides a user with an intuitive means to control the receiver.

The method may cause a data stream to be transmitted to a group of receivers. Such a method may be used, for example, to send a particular set of radio station URLs/metadata allowing predetermined receivers to be customised for a particular language or set of radio stations. In one embodiments this may allow an audio stream to be sent to shops belonging to a single chain and as such provide so called in-store radio and the like. The skilled person will appreciate that a chain of shops is given by way of example only and that tailoring of the audio stream to a group of receivers may allow corporations, associations, clubs, or the like to provide tailored audio streams.

The tailoring of the data may comprise tailoring of addresses that are sent to the network audio stream receiver according to the hardware address. The method may allow the receiver to connect to any of the addresses and receive the audio stream therefrom. The addresses may be URL's or the like. Tailoring of addresses in this manner may allow a predetermined list of addresses to be sent to the receivers according to the hardware address.

In an alternative or additional embodiment the tailoring of the data may comprise tailoring the audio stream. Such tailoring of the audio stream may be dependent upon a profile associated with the hardware address

and may be dependent upon a user profile associated with the hardware address. A user may choose to provide information that allows a profile to be constructed for that user and associated with the address. The method may forward profile information to a transmitter of the audio stream in order that it can be tailored to the user associated with the hardware address.

According to a second aspect of the invention there is provided a network audio stream receiver having a transceiver arranged to send and/or receive data from a network connection thereto, a processor arranged to process data, a digital to analogue converter (DAC) and a hardware address, the receiver being arranged such that the processor processes data received by the transceiver and causes the DAC to generate an audio signal therefrom, and the receiver being arranged such that the hardware address can be transmitted by the transceiver.

Such an apparatus is convenient because it allows data to be sent to the receiver that is tailored to a particular receiver. Such an arrangement may allow predetermined data to be sent to predetermined users overcoming a technical problem in the prior art that data could not be sent to predetermined users with certainty.

The network audio stream receiver may provide what is commonly referred to as an Internet radio receiver.

The transceiver may comprise a means for communicating with a wireless network such as a WIFI (IEEE 802.11) network, Bluetooth connection, or the like. Such a means is advantageous because it allows the receiver to be positioned more freely than a wired network connection. The skilled person will appreciate that there are many types of IEEE 802.11 network

and that any of them will be suitable. It may be likely however that 802.11a, b or g may be the most suitable.

Conveniently, the receiver comprises a display arranged to provide a user with feedback as to the functioning of the device. The display may comprise an LCD (Liquid Crystal Display), a LEP (Light Emitting Polymer) display, LED (Light Emitting Diode) or any other suitable display mechanism.

The receiver may comprise a selector arranged to allow a user to select information displayed on the display.

In one embodiment the selector comprises a rotary selector providing a convenient and intuitive means to allow a user to input data. The rotary selector may have associated therewith an integral or a separate push button.

The hardware address may be provided by a non-volatile memory, which may be of the write once variety. Alternatively, or additionally, the hardware address may be provided by a means such as DIP switches, fusible links or the like.

According to a third aspect of the invention there is provided a system comprising a receiver according to the second aspect of the invention connected to a second network, the second network being wireless and being arranged to provide data to the receiver such that the receiver can produce sound from the data.

An advantage of such a system is that it allows Internet radio to be received and listened to without the presence of a PC or other computer device.

The receiver may be battery powered. Such an arrangement when combined with a wireless second network provides a standalone device that is capable of receiving Internet radio without any wires thereto. In other embodiments the receiver may be powered by any other suitable means. For example, the receiver may be mains powered, solar powered, wind up, or the like.

According to a fourth aspect of the invention there is provided a server comprising a processor and a network transceiver, the transceiver being arranged to send and receive data from a network connection to the server, the data received from the network including an address of a receiver to which data providing an audio stream should be sent, the processor being arranged to receive the address and tailor the data prior to transmission to the receiver.

According to a fifth aspect of the invention there is provided a system comprising a receiver according to the second aspect of the invention connected to a server of the fourth aspect of the invention via a network connection.

The network connection may include an Internet connection. At least a portion of the Internet connection may comprise a wireless network connection.

According to a sixth aspect of the invention there is provided a machine readable data carrier containing instructions which when read onto a receiver and/or computer cause that receiver and/or computer to perform the method of the first aspect of the invention.

According to a seventh aspect of the invention there is provided a machine readable medium containing instructions which when read onto a receiver cause that receiver to function as the receiver of the second aspect of the invention.

According to an eighth aspect of the invention there is provided a machine readable medium containing instructions which when read onto a computer that computer to provide a portion of the system of the third aspect of the invention.

According to a ninth aspect of the invention there is provided a machine readable medium containing instructions which when read onto a server cause that server to function according to the server of the fourth aspect of the invention.

According to a tenth aspect of the invention there is provided a method of receiving data on a network audio stream receiver comprising providing the receiver with an interface means allowing a user to access the receiver across at least one network connection thereto, the receiver being arranged to hold meta-data that governs how data is received thereby and the method further comprising allowing a user to use the access means in order to edit and/or add to the meta-data.

Such a method is advantageous because it allows a user to tailor how he/she wishes the receiver, which may be an Internet radio, to function. Prior art receivers have not been as flexible as may be desired and were hard to configure. The provision of the interface means provides a convenient way for a user to alter the meta-data thus saving the user time and convenience and also providing flexibility to his/her device. It is also likely that the provision of the interface means will allow the receiver to be tailored more than prior art receivers.

The interface means may comprise a browser interface arranged to generate a web page when accessed using a web browser across the at least one network connection. It will be appreciated that a large number of PCs and other computers are provided with a browser and as such a browser is a familiar tool with which most people are familiar and have access to.

Conveniently, the interface means is accessible across a first network, which may comprise the Internet. Such a method is convenient because it allows the receiver to be accessed remotely and may allow the receiver to be accessed from 10's, 100's, or indeed 1000's of kilometres and generally from anywhere the network can be accessed which may be from anywhere in the world.

Additionally, or alternatively, the interface means is accessible across a second network. The second network may comprise a WIFI network, a Bluetooth network, or other wireless network. The second network may also comprise a wired network such as an Ethernet connection, a USB connection or the like. Allowing the interface means to be accessed across a second network in this manner may provide greater security than allowing access via a network such as the Internet.

The meta-data provided on the receiver may include any one or more of the following: the URL from which a predetermined audio stream may be obtained; a stream genre associated with that predetermined stream; stream or station name; website URL; country location; state location; city location. Allowing the user to edit this information may allow them to tailor how his/her receiver operates.

Conveniently the meta-data may also contain a user profile. The user profile may include any one or more of the following: age, sex, country of location, city of location, email address, telephone number, and the like.

The method may include providing the receiver with a plurality of identities each associated with at least one user and arranged to allow the user to store settings associated with that identity. Such an arrangement is convenient because it allows the receiver to be used by a plurality of people and thus make its use more flexible, etc.

According to an eleventh aspect of the invention there is provided a network audio stream receiver having a transceiver arranged to send and/or receive data from a network connection thereto, a processor arranged to process data, a digital to analogue converter (DAC) and a memory arranged to store meta-data, the receiver being arranged such that the processor processes data received by the transceiver and causes the DAC to generate an audio signal therefrom, and the receiver being arranged such that remote access can be gained via the transceiver to the memory and further arranged to allow such access to edit the meta-data held in the memory.

The memory advantageously comprises at least a portion of non-volatile memory. Such an arrangement is advantageous because it allows the meta-data to be maintained when the power is removed from the receiver (if the meta-data is held therein) which may make the receiver quicker to power up, changes are not lost and the like.

This aspect of the invention may contain further advantageous features as discussed in relation to any of the other aspects of the invention.

According to a twelfth aspect of the invention there is provided a system comprising a receiver according to the eleventh aspect of the invention connected to a second, wireless, network, the wireless network being arranged to provide data to the receiver such that the receiver can produce sound from the data.

According to a thirteenth aspect of the invention there is provided a machine readable medium containing instructions which when read by a machine cause that machine to perform the method of the tenth aspect of the invention.

According to a fourteenth aspect of the invention there is provided a machine readable medium containing instructions which when read by a receiver cause that receiver to function as a receiver according to the eleventh aspect of the invention.

The machine readable medium of any of the preceding aspects of the invention may comprise any of the following: a floppy disk, a CD ROM, a DVD ROM/RAM (including +R/+RW and -R/-RW), a memory (including but not being limited to any of the following examples of memory: EEPROM, Electrically Erasable Programmable Read Only Memory, EPROM, FLASH, writable non-volatile storage, ROM, SRAM, Static Random Access Memory, DRAM, Dynamic Random Access Memory, SDRAM Synchronous Dynamic Random Access Memory), a hard drive, a tape, a transmitted signal (including an Internet download an ftp transfer or the like), a wire.

There now follows by way of example only a detailed description of an embodiment of the present invention with reference to the accompanying drawings in which:

Figure 1 shows a schematic of a system according to the invention together with steps in using the system;

Figure 2 shows how menus provided on a receiver of Figure 1 operate;

Figure 3 shows a system diagram for a receiver connected to a first network;

Figure 4 shows a system diagram for the receiver of Figure 1;

Figure 5 shows a receiver as exemplified in Figure 1 and 3 connected to a second network; and

Figure 6 shows a flowchart outlining the operation of the system shown in the previous Figures.

The operation and arrangement of a receiver 2 is explained in relation to Figure 1. The receiver 2 provides a network audio stream receiver and is connected by a first network 4, in this case the Internet, to a server 6, which is generally remote from the receiver 2 and a broadcast server 8. The receiver 2 is also connected via a second network 10, in this case a WIFI (WIreless Fidelity) or IEEE 802.11 network, to an access point 12. As is known in the art the WIFI access point 12 broadcasts in a local area a connection to the Internet 4 and permits the receiver 2 to send and/or receive information to the Internet 4 whilst it is in communication with the access point 12.

Further details of the receiver 2 are expanded upon with reference to Figure 2. The receiver 2 comprises a processor 202 which is connected via a system bus 203 to a variety of other components including a

memory 204. The memory 204 includes a RAM (Random Access Memory) and a non-volatile memory such as an EPROM (Erasable Programmable Read Only Memory) or the like. The processor 202 typically comprises a Low power embedded processor, e.g.MIPS™, ARM™, StrongARM™, PowerPC™, Intel™ PXA255 and the like. It is conceivable that other processors may be used such as any of the following: INTEL™ PENTIUM™ series processor, AMD™ ATHLON™, POWERPC™, DIGITAL™ ALPHA™, processors are equally possible. Indeed, the processor 202 may be provided by an ASIC (Application Specific Integrated Circuit), FPGA (Field Programmable Gate Array), or other similar devices.

As is known in the art the non-volatile portion of the memory 204 contains the Embedded Operating System together with necessary device drivers and application software (which includes Internet Radio software). The RAM portion of memory 204 is a volatile memory used to hold instructions that are being executed (such as program code), together with data, etc. which can be accessed by the processor 202 via the system bus 203.

In the embodiment being described the receiver 2 runs a cut down version of the LINUX operating system which it boots from the non-volatile memory. The processor may run any of the following operating systems: HP-UX, UNIX, MICROSOFT™ NT, AIX™, WINDOWS, or may be an operating system having a TCP/IP stack.

It will be appreciated that although reference is made to a memory 204 it is possible that the memory could be provided by a variety of devices. For example, the memory may be provided by a cache memory, a RAM memory, a local mass storage device such as a hard drive, any of these connected to the receiver 2 over a network connection. However, the

processor 202 can access the memory via the system bus 203 to access program code to instruct it what steps to perform and also to access data. The processor 202 then processes the data samples as outlined by the program code.

The receiver 2 also comprises a display 206 which in this embodiment is provided by an LCD (Liquid Crystal Display) 206 of the monochrome variety and capable of displaying 2 lines of characters with each line having 18 characters. As such, the display provides feedback to a user thereof as to the functionality of the receiver 2. It will be appreciated that other versions of the receiver may be provided which have colour screens, or screens other than LCD (such as Light Emitting Polymer LEP).

A transceiver 200 is provided that allows the processor 202 to communicate with the first 4 and/or the second network 10. In the embodiment the transceiver 200 comprises a WIFI (IEEE 802.11) network card that allows the receiver to connect to a second network 10 which can then provide access to the Internet (a first network 4). The skilled person will appreciate that there are a variety of WIFI protocols and any of these in envisaged. However, it is likely that IEEE 802.11a, b, or g would be used.

An amplifier 212 including a DAC 213 (Digital to Analogue Converter) is provided and communicates with the processor 202 via the system bus 203. The DAC 213 is arranged to receive data representing an audio stream from the processor 202 convert this digital data into an analogue signal which is amplified by the amplifier 212. The amplified audio signal is then passed to one or more speakers 215 and/or a headphone jack 217 into which a pair of headphones can be connected.

The receiver also comprises a hardware-encoded address, or serial number 208 which can be read by the processor 202 across the system bus 203. In this embodiment the address 208 is provided as a separate non-volatile memory provided by an EEPROM (Electrically Erasable Programmable Read Only Memory) but could equally be provided in the memory 204, or via a means such as fusible links or the like. It is perhaps preferred to use a means such as a PROM such that a user of the receiver 2 cannot alter the address 208.

In the embodiment shown the receiver also comprises a AM/FM decoder 210 that allows the receiver 2 to receive, decode and play AM (Amplitude Modulation) and FM (Frequency Modulation) radio signals as is well known in the art. It would of course also be possible to include a DAB (Digital Audio Broadcasting) receiver to allow DAB radio stations to be received. Other embodiments of the invention may not be provided with an AM/FM decoder 210.

Inputs are provided to the receiver 2 via a rotary encoder 228, which provides a selector, the function of which will be described hereinafter and four push to make non-latching switches 230, 232, 233, 234. The rotary encoder 228 also functions as a volume control. The four switches 230-234 provide a select switch 230 that is used in conjunction with the encoder 228, a reply switch 232, a back switch 233 and an on/off switch 234.

To allow the rotary encoder 228 to function as both a volume control and a selector, its function changes according to whether the receiver 2 is playing an audio stream; whilst a stream is playing the rotary encoder 228 functions as a volume control. The receiver 2 is constructed such that when an audio stream is playing a user may force the rotary encoder 228 to function as a selector by pressing the select switch 230. An LED (not

shown) on the receiver 2 shows the current functionality of the rotary encoder 228.

A power supply 214 is provided to power the receiver 2 which may take its source of power from a mains supply or from batteries provided in the receiver 2. Other embodiments may be powered by other power sources such as a wind-up, solar power, or the like.

The memory 204 comprises a plurality of software modules: a menu generation and navigation module 216; a network configuration and control module 218; one or more audio decoder modules 220; a web browser interface module 222 which provides an interface means; metadata 224 and a user reply and advert reply module 226.

As will be described in relation to Figure 3 the menu generation module 216 causes the processor 202 to display a plurality of menus on the display 206 with each menu comprising a plurality of options. In view of the limited nature of the display 206 it is caused to display only one of the options at any one time. A user may select the currently displayed option by pressing the select switch 230. Additionally, a user may press the back switch 233 to return to the menu option from which he/she has originated before the select switch 230 was pressed.

When a user presses the select switch 230 the processor will cause an appropriate action to occur which may be causing the display 206 to display an option from a further menu or to cause the receiver 2 to perform a desired action.

Generally, the display 206 is caused to display a top-level menu 300 which comprises the following options: favourites 302; station 304; configure 306 and quiet 308. The rotary encoder 228, when rotated,

causes the display to switch between displaying these four options. Pressing the select switch 230 whilst the Favourite option 302 is displayed causes a list of favourite stations to be provided which can be scrolled through using the rotary encoder 228 and selected for play using the select switch 230.

Pressing the select switch 230 whilst the configure option 306 is displayed causes a configuration menu to be displayed.

Pressing the select switch 230 whilst the quiet option 308 is displayed causes the receiver to be muted.

The station option 304 provides a mechanism to allow a user to select a station from a number that are available. Pressing the select switch 230 whilst the station option 304 is displayed causes a sub menu 310 to be displayed which itself comprises three options: a name option 312; a genre option 314 and a location option 316.

The name option 312 allows a user to select a station by its name and causes a sub menu 318 to be displayed that comprises four options: a to f 320, g to l 322; m to r 324 and s to z 326. The rotary encoder 228 causes the display to cycle between these four options. Pressing the select switch 230 on any one of the options causes a list of stations 328 to be displayed that start with the letters selected in that option. A desired station can be selected by pressing the select switch 230 on when the station name is displayed. The station names are sorted by the processor 202 of the receiver 2.

The genre option 314 allows a user to select a station according to the genre to which that station has been classified and causes a sub menu 330 to be displayed. In this embodiment four genre options (rock 332;

pop 334; jazz 336 and classical 338) are displayed but it will be appreciated that there are many further possible genres and that these four options have been provided as an example only. The genre of a station is provided by the metadata associated with the station. Pressing the select switch 230 on any one of the options causes a list of stations 328 to be displayed that are classified in the selected genre. A desired station can be selected by pressing the select switch 230 on when the station name is displayed.

The location option 316 allows a user to select a station according to the location of where the station is situated and causes a sub menu 340 to be displayed. In this embodiment four location options (USA 342; UK 344; Europe 346 and Asia 348) are displayed but it will be appreciated that there are many further possible locations and these four options have been provided as an example only. Pressing the select switch 230 on any one of the options causes a list of stations 328 to be displayed that are classified as being in that particular location. The location of a station is read from the metadata associated with a station. A desired station can be selected by pressing the select switch 230 on when the station name is displayed.

The list of stations 328 is of variable number depending on the number of stations that are selected by the option used to reach the list 328. Once a user has selected a station by pressing the selector switch 230 an audio stream of data is played back using the receiver to access a URL (Uniform Resource Locator) provided by metadata associated with the selected station.

Figure 4 shows how the receiver 2 is connected to the first 4 and/or second 10 networks. As described above the receiver 2 can connect to a WIFI network 400 which provides, in this embodiment, the second

network. The second network 2 is provided by an ADSL (Asymmetric Digital Subscriber Line) or cable router 402. It would also be possible for the receiver 2 to connect to the ADSL router 402 using other connections such as a USB (Universal Serial Bus) 404, an Ethernet connection 406, or the like. The router 402 is connected to the Internet (first network) 4 and as such provides a connection to the first network 4 from the second network 10. The arrangement shown in Figure 4 therefore provides an Internet connection to the receiver 2. The skilled person will appreciate that there are many ways of providing such an Internet connection and the embodiment of Figure 4 is provided as an example of one convenient set up.

Figure 5 further expands upon how a receiver 2 is used. The Figure shows a plurality, in this case seven, receivers 2 connected to the Internet 4. As such each of the receivers 2 is capable of receiving an audio data stream from the Internet that can be converted in sound, generally a radio program, by the receiver 2. The Figure also shows four web servers 500, 502, 504, 506 connected to the Internet 4 each of which has data stored thereon that can be used to provide data streams of audio data - for example to provide audio on demand.

Radio stations 508, 510 are also connected to the Internet 4 and provide data that is an encoding of a live radio broadcast as a data stream using a broadcast server 8. It will be appreciated that if the data is not an encoding of a live broadcast it may be thought of as data held on a server 500-506 in order to provide audio on demand.

Two further server 512, 514 are provided with a connection to the Internet 4 and hold metadata relating to radio stations and audio on demand streams that are available to user with a receiver 2. In the Figure, the receivers 2 have example addresses (1001, 1002, 2001, 2002,

2054, 2055, 2056). The meta-data servers 512, 514 contain different meta-data and allow access to the meta-data according to the address 208 that is read from a receiver 2. For example, server 512 allows access to meta-data thereon only to receivers 2 whose address 208 starts with a one and server 514 allows access to meta-data thereon only to receivers 2 whose address 208 starts with a two. The function of the meta-data will be explained hereinafter.

Each of the stations displayed by the menus described above corresponds to a network address, generally a URL, held in the memory 204 as such metadata. When a user selects a station the receiver 2 accesses the network address in order to receive the audio stream. The list of stations held in the memory 204 is updated on a periodic basis from the servers 512,514 on the network. In some embodiments the list of stations is refreshed on power up of the receiver 2 and periodically thereafter.

The Figure also shows a PC 516, or other such computer, connected to the Internet 4. The PC 516 is provided with a browser (such as Microsoft™ Internet Explorer™, Netscape™ Navigator™ or the like) that allows meta-data to be added to and/or modified on the servers 512,514. The metadata may also be modified on the receiver 2.

Each receiver 2 has an IP address that allows it to be accessed remotely via a web browser enabled PC or other computer (such as PC 516). Although a certain amount of configuration may be accomplished via the display206, rotary encoder 228 and select switch 230 it may be more convenient to use the PC 516 to access the receiver and alter the configuration. Although as expanded upon below meta-data detailing sources of audio data are held in the meta-data module 224 and on the meta-data servers 512,514 it is also possible for a user to add his/her own meta-data to the using the PC 516. It is also possible for the user to edit

configuration files and the user profile information that is described below using the web browser on the PC 516.

The metadata may be modified on the receiver as follows. It will be appreciated that the receiver 2 may not hold in its memory 204 metadata for all available stations. It is therefore convenient to allow a user to add further stations and/or modify the metadata in other ways. Using the hardware address (in this case the IP address) a user may log onto his/her receiver 2 and add metadata using a browser interface, or the like.

In other embodiments it is possible for the user to add a radio station to a server 512,514 on the network (e.g. the Internet 4) from which the receiver 2 updates its metadata. In this manner the next time that the receiver 2 updates its metadata it would receive the new station. It may of course be possible for a user to force a receiver 2 to update its metadata.

Once the user has logged onto the receiver 2 he/she is presented with a screen (not shown) showing a list of stations together with the metadata associated with each station. An editor is provided allowing the user to edit the existing data or to add further data. In some embodiments the user may be able to construct a list of favourite stations.

The operation of the system described so far will now be explained in relation to Figure 6. As a first step 600 power is applied to the receiver 2. On power up the processor 202 boots an operating system from the memory 204 and starts to perform instructions laid out therein. Once boot up has occurred the receiver 2 connects to the WIFI (i.e. the second 10) network and thus gains connection to the Internet 4 using the browser interface 222 and network configuration and control modules 218 (step 602). Once a connection has been established to the Internet 4 the

receiver 2 connects to a predetermined URL (i.e. one of the servers 512, 514) and requests a station list (step 604). This step includes sending the address of the receiver 2 to the URL. The meta-data may be stored in a non-volatile portion of the memory 204 so that the receiver 2 can function initially without having to download the meta-data and thus the step 604 may update the meta-data rather than download a fresh copy.

The server 512, 514 to which the request was forwarded then returns a list of stations or other data streams to the receiver 2 (step 606) assuming that the address that it has received is allowable. If the address 208 is not correct then no meta-data is returned to the receiver 2. It will be appreciated that other arrangements may be possible. For example the second network 10 may contain storage that contains a list of station meta-data that is sent to the receiver when it powers up and which is updated periodically from the meta-data servers 512, 514.

The meta-data is downloaded to the receiver and stored in the memory 204 i.e. as module 224. Once the list of meta-data has been loaded to the receiver 2 (whether from a remote memory across the Internet 4 - i.e. server 512, 514 or from a local storage - e.g. memory on the second network 2) the user makes an input via the rotary encoder 228 and select switch 230 to select a station or other audio stream to which he/she wishes to listen. Thus a request is sent from the receiver 2 across the Internet 4 to the URL as specified in the meta-data associated with the selected station (step 608). In this embodiment, whenever the receiver 2 sends out a request a second request is sent to the meta-data server 512,514 to confirm whether the meta-data held by the receiver 2 in the module 224 needs updating. If it is determined that an update is required then the updated meta-data is downloaded to the receiver 2.

When the server hosting the requested data 500-506 or the radio station 508, 510 receives the request then a new Unicast session is started for that request and a data stream is send across the Internet (step 610). It will be appreciated that the data stream will be compressed according to a know CODEC (Compressor/Decompressor).

Once the audio stream has started it is received by the access point 12 and transmitted across the second, WIFI, network 10 to the receiver 2 (step 612). The processor 202 receives the data stream and decodes it using the Audio decoders (CODECs) 220 held in the memory 204 and causes sound to be generated by the speaker and/or headphones (step 614). The skilled person will appreciate that there are a plurality of different CODECs available and the audio decoder module 220 is provided with common CODECs. In the embodiment being described CODECs are provided for MP3, Real Audio®, Microsoft WMA® and Vorbis Audio Streams.

It will be appreciated from above that the memory 204 of the receiver 2 comprises a user profile and advert reply module 226. If the user of the receiver 2 agrees, a user profile is held herein which may contain information such as: age, sex, country of location, city of location, email address, telephone number, and the like. Generally, no information will be held that can identify the user in order to maintain his/her anonymity. It is known for radio stations to have adverts within their programs and the advert reply module together with the reply switch 232 allow a user to reply to an advert. For example, if the station to which a user is listening plays an advert a statement may be made such as "make reply now in order to receive further details". Should a user wish to receive further information then he/she can press the reply switch 232 and so cause the receiver 2 to send a request across the Internet 4 to the radio station. The

requested data can then be added to the audio stream that is being sent to the receiver 2.

The user profile may allow profile and listening statistics to be provided to advertisers and broadcasters perhaps in return for a fee.

Some embodiments of the invention may also comprise one or generally a plurality of pre-set station buttons that can be programmed by a user. When such a button were pressed the receiver 2 would be caused to receive the station (or other audio stream) that was associated with that button.

It will be apparent from the discussion above that the meta-data downloaded to the receiver 2 contains at least the following information: name, location, station data elements (that describe an Internet Radio broadcast and/or a stored Audio stream) and genre. In one embodiment the meta-data is stored as an XML file but could equally be stored as an SQL database or the like.

The station data elements include at least the following: the URL for the stream; stream genre (there may be multiple streams); stream or station name; website URL; country location; state location; city location. More fields may be added to the station data elements and it is not necessary to populate all of the fields for any one entry.

In this particular embodiment the meta-data held on the meta-data servers 512, and 514 and in the module 224 is encrypted in order that its contents is protected and less easy to intercept.

The skilled person will appreciate that software and hardware are interchangeable and that many features of embodiments of this invention may be provided by hardware and/or software.